2.7.3.1 On-Site Versus Off-Site Disposal Alternative Comparison

Depending on the off-site disposal cell location and mode of transportation, off-site disposal would cost approximately 63 to 118 percent more than on-site disposal. In absolute terms, off-site disposal would cost approximately \$158 million to \$294 million more than on-site disposal, depending on the off-site disposal location and mode of transportation.

2.7.3.2 Off-Site Transportation Options Comparison

Among the three transportation options, truck haul would be the least expensive and slurry pipeline the most expensive. The cost difference between rail and slurry pipeline would be less than 2 percent. Truck transportation would cost approximately 10 to 15 percent less than either rail or slurry pipeline.

2.7.3.3 Off-Site Disposal Cell Locations Comparison

The costs for off-site disposal at the Klondike Flats and Crescent Junction sites would be comparable, differing less than 2 percent regardless of the mode of transportation. Consistent with this, the estimates indicate that transport distance is not a key factor in cost for the off-site disposal alternatives. The approximate ratio of the distances of the Klondike Flats, Crescent Junction, and White Mesa Mill sites from the Moab site is 1:1.7:4.7. However, despite the almost 5 times longer distance to White Mesa Mill, truck transportation would cost only 22 percent more for the White Mesa Mill site than for the Klondike Flats site, and slurry transportation would cost only 15 percent more. Nonetheless, the absolute increase in cost under the White Mesa Mill off-site disposal alternative would be substantial. Compared to the cost to ship to the Klondike Flats site, shipping to the White Mesa Mill site would cost \$90 million more for truck transport and \$71 million more for pipeline transport. In contrast, the absolute increase in cost for the Crescent Junction site over the Klondike Flats site would be only about \$3 million to \$7 million, depending on the mode of transportation.

2.8 References

- 10 CFR 1022. U.S. Department of Energy, "Compliance with Floodplain and Wetlands Environmental Review Requirements."
- 10 CFR 40. U.S. Nuclear Regulatory Commission, "Domestic Licensing of Source Material."
- 40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."
- 40 CFR 1500–1508. Council on Environmental Quality, "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act."
- 49 CFR 171. Research and Special Programs Administration, Department of Transportation, "General Information, Regulations, and Definitions."
- 49 CFR 172. Research and Special Programs Administration, Department of Transportation, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements."

- 49 CFR 173. Research and Special Programs Administration, Department of Transportation, "Shippers—General Requirements for Shipments and Packaging."
- 49 CFR 177 Research and Special Programs Administration, Department of Transportation, "Carriage by Public Highway."
- 62 FR 8693–8704, U.S. Department of Energy, "Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, Washington," *Federal Register*, February 26, 1997.
- ANSI/ASME (American National Standards Institute/American Society of Mechanical Engineers), 1989. *Slurry Transportation Piping Systems*, standard B31.11-89, reaffirmed 1998.
- Bredehoeft, J.D., 2003. "From Models to Performance Assessment: The Conceptualization Problem," *Ground Water*, 41(5):571–577.
- DOE (U.S. Department of Energy), 1988. *Vicinity Properties Management and Implementation Manual*, UMTRA DOE/AL-050601, U.S. Department of Energy, Grand Junction, Colorado, March.
- DOE (U.S. Department of Energy), 1996a. Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project, DOE/EIS-0198, U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, October.
- DOE (U.S. Department of Energy), 1996b. *In-situ Vitrification*, fact sheet, U.S. Department of Energy, Brookhaven National Laboratory, available at: http://www.bnl.gov/erd/Surface/ou1/ISV-facts.pdf.
- DOE (U.S. Department of Energy), 1998. Demonstration Project Report for the Transportable Vitrification System at the Oak Ridge East Tennessee Technology Park, K/WM–186, Vol. I, prepared by East Tennessee Technology Park, Oak Ridge, Tennessee, May.
- DOE (U.S. Department of Energy), 2001a. Internal DOE memorandum to James Owendoff (EM–2), from Joyce Jamie (EM–34), "Applicability of Soil Washing Technology to Moab Mill Tailings," dated June 1.
- DOE (U.S. Department of Energy), 2001b. *Preliminary Plan for Remediation*, draft, GJO-2001-269-TAR, U.S. Department of Energy, Grand Junction, Colorado, October.
- DOE (U.S. Department of Energy), 2002a. Fugitive Dust Control Plan for the Moab, Utah, UMTRA Project Site, GJO-2002-301-TAR, U.S. Department of Energy, Grand Junction, Colorado, March.
- DOE (U.S. Department of Energy), 2002b. Work Plan for Implementation of the Initial Action in the Sandbar Area Adjacent to the Moab Project Site, GJO-2002-299-TAR, U.S. Department of Energy, Grand Junction, Colorado, March.

- DOE (U.S. Department of Energy), 2003a. *Migration Potential of the Colorado River Channel Adjacent to the Moab Site*, Revision 2, U.S. Department of Energy, Grand Junction, Colorado, November.
- DOE (U.S. Department of Energy), 2003b. *Site Observational Work Plan for the Moab, Utah, Site*, GJO-2003-424-TAC, U.S. Department of Energy, Grand Junction, Colorado, December.
- DOE (U.S. Department of Energy), 2005a. Fall 2004 Performance Assessment of the Ground Water Interim Action Well Fields at the Moab, Utah, Site, DOE-EM/GJ769-2004, U.S. Department of Energy, Grand Junction, Colorado, January.
- DOE (U.S. Department of Energy), 2005b. *Ground Water/Surface Water Interaction for the Moab, Utah, Site*, Calculation No. 03-2005-03-03-00, U.S. Department of Energy, Grand Junction, Colorado, March.
- DOE (U.S. Department of Energy), 2005c. *Performance of the Ground Water Interim Action Injection System at the Configuration 2 Well Field*, Calculation No. Moab-04-2005-03-03-00, U.S. Department of Energy, Grand Junction, Colorado, April.
- EPA (U.S. Environmental Protection Agency), 1971. Correspondence: Joint Committee on Atomic Energy (U.S. congress) and EPA: Titled: Environmental Protection Agency Progress Report on Uranium Mill Tailings Activities, December 31.
- EPA (U.S. Environmental Protection Agency), 1988. Guidelines for Ground-Water Classification Under the EPA Ground Water Protection Strategy, PB95-169603, U.S. Environmental Protection Agency, Washington, D.C., June.
- EPA (U.S. Environmental Protection Agency), 1995. Cost Performance Report: Soil Washing at the King of Prussia Technical Corporation Superfund Site, Winslow Township, New Jersey, Office of Solid Waste and Emergency Response, March.
- EPA (U.S. Environmental Protection Agency), 1997. Cost Performance Report: In Situ Vitrification at the Parsons Chemical/ETM Enterprises Superfund Site, Grand Ledge, Michigan, Office of Solid Waste and Emergency Response, July.
- EPA (U.S. Environmental Protection Agency), 1999. 1999 Update of Ambient Water Quality Criteria for Ammonia, EPA-822-R99-014, U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, Washington, D.C., December.
- EPA (U.S. Environmental Protection Agency), 2001. *Abstracts of Remediation Case Studies*, Volume 5, EPA542–R–01–008, Federal Remediation Technologies Roundtable, May.
- FRTR (Federal Remediation Technologies Roundtable), 2001. "Cost and Performance, Catalog of Case Studies," www.frtr.gov/cost/index.html, October 17.
- Gardner, Phillip P., and D.K. Solomon, 2003. *Investigation of the Hydrologic Connection Between the Moab Mill Tailings and Matheson Wetland Preserve*, Department of Geology and Geophysics, University of Utah.

- IUC (International Uranium Corporation), 2003. "Overview of White Mesa Mill Operations and Moab Tailings Relocation Project," presentation for the U.S. Department of Energy, February.
- Mayne, P.W., and J. Beaver, 1996. "High Temperature Plasma Vitrification of Geomaterials," *Electronic Journal of Geotechnical Engineering*, Volume 1, Fall.
- NAS (National Academy of Sciences), 2003. Letter to Donald R. Metzler, U.S. Department of Energy, Grand Junction, Colorado, from Micah D. Lowenthal, Senior Program Officer, National Academy of Sciences, dated September 22.
- NRC (U.S. Nuclear Regulatory Commission), 1989. *Calculation of Radon Flux Attenuation by Earthen Uranium Mill Tailings Covers*, Regulatory Guide 3.64 (Task WM 503-4), U.S. Nuclear Regulatory Commission, Washington D.C.
- NRC (U.S. Nuclear Regulatory Commission), 1999. Final Environmental Impact Statement Related to Reclamation of the Uranium Mill Tailings at the Atlas Site, Moab, Utah, NUREG-1531, Office of Nuclear Material Safety and Safeguards, Washington, D.C., March.
- NRC (U.S. Nuclear Regulatory Commission), 2002. *Design of Erosion Protection for Long-term Stabilization*, NUREG-1623, U.S. Nuclear Regulatory Commission, Washington, D.C.
- Pickett, J.B., S.W. Norford, J.C. Musall, and D.J. Bills, 2000. *Vitrification and Privatization Success*, Rev. 1, WSRC–MS–2000–00305, Westinghouse Savannah River Company.
- PSI (Pipeline Systems Incorporated), 2003. *Moab Tailings Pipeline Transportation Conceptual Study*, Document No. 1028-G-G-002, June.
- Stormont, J.C., and C.E. Morris, 1998. "Method to Estimate Water Storage Capacity of Capillary Barriers," *Journal of Geotechnical and Geoenvironmental Engineering*, 124(4):297–392, American Society of Civil Engineers, Reston, Virginia, April.
- UAC (Utah Administrative Code), 2000. "Emission Standards: Fugitive Emissions and Fugitive Dust," *Utah Administrative Code* R307-205, effective January 1, 2000.
- USF&WS (U.S. Fish and Wildlife Service), 2002. "Recovery Goals for Four Endangered Fishes of the Colorado River," available at: http://www.r6.fws.gov/crrip/rg.htm.
- USGS (U.S. Geological Survey), 2002. A Site-Specific Assessment of the Risk of Ammonia to Endangered Colorado Pikeminnow and Razorback Sucker Populations in the Upper Colorado River Adjacent to the Atlas Mill Tailings Pile, Moab, Utah, Final Report to the Fish and Wildlife Service, Division of Environmental Quality, Salt Lake City, Utah, United States Geological Survey, December.
- USGS (U.S. Geological Survey), 2005. *Initial-Phase Investigation of Multidimensional Streamflow Simulations in the Colorado River, Moab Valley, Grand County, Utah, 2004*, Scientific Investigations Report 2005-5022, U.S. Geological Survey, February.